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FINAL REPORT

LARGE SCALE FEEDING STUDIES ON THE USE OF MICRONIZED HULLESS BARLEY AND FEED WHEAT FOR EARLY WEANED PIGS

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Growth performance of nursery pigs fed infrared processed wheat

C Shinkewski, C. Smit, J. Gowans, J. Patience, J. Harding

Introduction

Cereal grains have a high level of stored protein and energy in the form of starch. In order for the starch to be broken down, both the starch and enzyme must be immersed in water. Most of the starch is stored in water-resistant granules, relatively inaccessible to digestive enzymes. However, when cereals are cooked, the starch granules open up becoming readily soluble in water, increasing enzyme activity and thereby improving the availability of energy and protein. This results in better utilization of the starches and less residual substrate and subsequent fermentation.

The infrared process uses infrared energy to cook the cereal grains. The energy is absorbed by the grains and causes a vibration between the constituent molecules resulting in an increase in vapor pressure and temperature which effectively cooks the grain without adversely affecting the important amino acids such lysine. The grain is then subjected to a flaking process while the grains are still hot, that increases the availability of starch above that of grinding or rolling alone (Cole, 1999). The end product is a cereal flake, that is high in nutritional value, highly palatable with ideal texture and handling properties.

Materials & Methods

210 gilt and 210 barrow piglets of mixed breeds (Landrace X Large White, FI X large White) were weaned and fed high quality commercial starter diets (Easiwean 1, Easiwean 2; Landmark Inc.) for 2 weeks prior to the start of the trial. At 14 days post weaning approximately 28 days of age, the pigs were regrouped according to size and placed into 10 male and 10 female pens containing 21 pigs each. All pens were then weighted and allocated to either the treatment or control group. Groups were blocked for gender, average pig weight, and location within the research room. Pens were re-weighed once per week, coinciding with the end of 3 discrete stages (stages 3, 4, & 5). Pigs removed from the trial for sickness or death were weighed upon removal, and recorded. The removal of sick pigs was confined to those too ill to compete with pen mates. Sick pigs remaining in pens were treated and subsequently monitored by treatment staff. Throughout the trial, full lighting was maintained for 8 hours per day. The room temperature was reduced from 23 C to 17 C using a 49 day step down program and supplemental local heat was provided as required by hot water concrete floor pad located in front of each pen. Pigs were fed ad libitrum via a 4 foot dry feeder. All feed supplied to the feeder was accurately weighed using a load cell equipped feed cart (Koendars Manufacturing). Treatment and control diets were milled using annon-farm Weightronix vertical mixer, and budgeted as follows: stage 3-5.5 kg/pig; stage 4 – 4.5kg/pig; stage 5 – ad lib to dispatch (day 37). Diets were formulated to balance digestible energy, with the essential amino acid including lysine, threonine, methionine/cystine and tryptophan (Table I). The treatment diets were milled with Infrared processed wheat (InfraReady Products Limited, Saskatoon, SK), while the control diets were milled using unprocessed wheat of the same source. A sample of both wheat types were supplied by the processor and analysed for crude protein (Norwest Lab, Lethbridge, AB). All diets were medicated with 44 grams per tonne lincomycin as a growth promotant. Statistical analysis was performed using commercial software (Statistix v4.0). Average pig weight (WT), average daily gain (ADG), average daily feed intake (ADFI), feed conversion rate (FCR), feed cost per pig ($/pig) and feed cost per kilogram gain ($/kg) were analysed using the Students t-test for each stage, and combined stages 3 to 5.

Results and Discussion

One treatment pen was excluded from the analysis, because more than 1 pig was removed from the pen which would have otherwise created a discrepancy in pen density and a potential confounding factor. Thus, 9 treatments and 10 control pens remained in the analysis. Treatment and control pens were of equal average weight at the trials onset. There were no statistical

differences in WT, ADG, ADFI, or FCR throughout any of the feeding stages. However, the added processing costs of the infrared processed wheat exceeded that of the standard wheat, by a margin not attributable to assay variability.

1. Big Sky Farms Inc. Humboldt, SK
2. Gowans Feed Consulting, Red Deer, AB
3. Prairie Swine Centre Inc. Saskatoon, SK

The reasons for this large difference remains unclear, but may include sampling error, or differences in the source of wheat tested. Although the growth performance attained during the trial were on par with experience, it is possible that growth was limiting in a way that prevented the expression of the full benefits of the infrared process in the treatment group.

Conclusions and Implications

In spite of the reported benefits of the infrared process, our study failed to show a benefit in growth performance. Furthermore, this additional cost of the process cannot be justified at the present time.

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Table 1. Formulation and nutrient density of treatment and control diets

Stage	Control and Treatment Diets		
	3	4	5
Nutrient density			
Protein (%)	22.1	25.7	26.3
Fat (%)	4.3	3.9	2.6
Fibre (%)	2.7	3.4	3.8
DE (kCal/kg)	3600	2550	3500
Ca (%)	0.92	0.89	0.80
Phos (%)	0.70	0.74	0.68
D-lysine (%)	1.36	1.31	1.3
D-threonine (%)	0.79	0.75	0.74
D-meth/cyst (%)	0.81	0.77	0.75
D-tryptophan (%)	0.22	0.25	0.26
DE/D-Lys	2.65	2.73	2.69
Formulation (%) of diet)			
Wheat **	35.8	44.6	46.2
Oat groats	20.0	10.0	
Soybean meal	25.0	35.0	35.0
Peas			
Prol-lac	12.5		
Blood cells	1.0		
Canola oil	2.0	1.9	1.1
Diet cost – Treatment	$370.39	$265.24	$247.34
- Control	$336.36	$222.86	$203.46

** Infrared processed wheat substituted for regular wheat in treatment diets.

Table 2 Growth performance of pigs fed infrared processed wheat

Performance		Control	Treatment	Diff	Sig'n
Wt-day 0	kg	6.99	6.97	-0.020	Ns
Wt-day 37		24.92	24.51	-0.41	"
Days 3	days	14	14		
Days 4		8	8		
Days 5		15	15		
Days 3-5		37	37		
ADG3	g/d	345.0 (45.2)	349.0 (28.3)		Ns
ADG 4		478.3 (49.6)	455.6 (44.3)		"
ADG 5		640.0 (60.5)	605.8 (49.8)		"
ADG 35		488.7 (39.0)	473.8 (37.2)		"
ADFI 3	g/d	472.2 (59.0)	462.8 (44.0)		"
ADFI 4		698.8 (77.9)	652.4 (66.7)		"
ADFI 5		1080.2 (106.8)	1027.8 (86.6)		"
ADFI 35		766.0 (77.9)	732.8 (60.8)		"
FCR 3	kg/kg	1.37 (0.06)	1.33 (0.06)		
FCR 4		1.46 (0.17)	1.46 (0.06)		
FCR 5		1.69 (0.09)	1.70 (0.08)		
FCR 35		1.56 (0.05)	1.55 (0.03)		
Fed cost 3	$/kg	2.22 (0.28)	2.40 (0.22)		
Feed cost 4		1.24 (0.14)	1.38 (0.14)		p = 0.05
Feed cost 5		3.30 (0.32)	3.81 (0.32)		p = 0.004
Feed cost 35		6.76 (0.70)	7.59 (0.63)		p = 0.01
Cost/gain 3	$/kg	0.46 (0.02)	0.49 (0.02)		p = 0.007
Cost/gainn4		0.33 (0.04)	0.39 (0.02)		p = 0.003
Cost/gain 5		0.34 (0.02)	0.42 (0.02)		p<0.001
Cost/gain 35		0.37 (0.01)	0.43 (0.08)		p<0.001